

# COST EFFECTIVE NEXT GENERATION SUBMARINE APPLICATION MANAGEMENT

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**Abstract:** There's an industry demand for thin submarine application management able to leverage technology to manage complexity across the network, to minimize overall IT operating cost, to keep network up and running efficiently and to facilitate remote management through internet.

This paper presents and discusses multiple innovative solutions to answer to those challenges, giving to the operator ease of use, which reduces training time and IT operations, ease of deployment and upgrade by plug and play mechanisms ensuring a smooth migration path and keeping operational expenditures at a minimum, intuitive graphical interface, advanced features to reduce downtime network and quick customer feedback facing network or equipment problems.

Some others topics like reliability, security wherever operator is based (locally in the station or externally via internet connection offered by combining hardware platform enhancements and new software services), and scalability when it's required based on user adoption are presented.

## 1 INTRODUCTION

In today's competitive environment, operators face a number of operational and business imperatives. Operationally, they must control costs while dealing with increased complexity and demands for improved performance and availability of services. Besides handling infrastructure and application upgrades, station staff must react to and resolve faults and problems as promptly as possible.

Above all, network management infrastructure and applications must be secure and reliable, deliver high performance, and be scalable and flexible enough to adjust quickly to varying business needs.

Next generation submarine application management will assist station staff to satisfy the above objectives and constraints.

## 2 EASE OF USE

There's a need to simplify and automate operational process to hide the complexity coming from newer technologies or equipment technology, to provide a simple but powerful graphic user interface (GUI) to guide operators in their ordinary tasks, as well as in specific infrequent operations.

Next generation submarine application will propose comprehensive GUI with manual point-and-click operations assisted by configurable workflow "wizards" and operation templates. This will enable flow-through process automation of highly frequent management tasks such as network construction, routine maintenance activities used periodically as part of the preventive maintenance to anticipate future problems, etc.

The GUI philosophy will respect hierarchical view with navigation tree, will allow rapid view selection through task bar facility. Tabular or graphical data representation could be selected by the operators.

Such ease of use will reduce training time, will decrease typing and will increase accuracy and productivity. Displays will be organized into a very intuitive and hierarchical set of layers that make it easy for operators to operate submarine systems.

Look and feel between all the components part of next generation submarine application will be compliant with style guide defining common font, the color (background color for the tooltip and the tree view etc.), logos, etc.

## 3 ADVANCED FEATURES

Such features are needed to increase end-customer satisfaction, while providing operators with additional revenue-generating opportunities.

### 3.1 Forecast network capacity management and growth

In high-growth economies, one main objective is to efficiently plan and execute network growth to keep network capacity above traffic demand.

Such capacity analysis tool will help operator automatically extract utilized and spare capacity information from network element and inventory management systems. Its physical and logical capacity reports will support network capacity planning and growth forecasting helping operator monitor network utilization in order to determine when and where new capacity is required.

### 3.2 Export data for planning tool

Along with network engineering and planning tools, a powerful network inventory tool is critical.

Data export capabilities to centralized inventory management systems will be made available. It will provide a complete and clear inventory of network elements with auto-discovery facilities detecting new

equipments as soon as they're introduced inside the network, reflecting an accurate picture of the network.

An centralized inventory database will include the description of the network structure (both physical and logical) and of the product catalog, as well as a description of associated service with a list of parameters to be activated.

### 3.3 Performance Management tool

Such tool will pre-empt potential network problems with real-time visibility, maximize uptime by proactively tracking faults to their source.

It will simplify analysis and planning with drill-down reports for every organizational level ;

- Executives who want a quick overview can access high-level reports showing how resources are performing over time.
- Network managers can obtain detailed accounts of how devices are performing, helping spot and address problems to optimize performance and efficiency.
- Application managers can keep tabs on traffic volume, application transaction response times and other critical data for evaluating performance and ensuring maximum availability.

It will offer comprehensive advanced reporting tool that enables the operator to generate custom presentation-quality reports and graphs with no longer needs to export files to complex commercial reporting packages.

### 3.4 Fault tracking to their source

Next generation submarine platform will guide the operator straight to the source of network infrastructure problems. The ability to associate events in real time with specific devices, tributary etc. helps reduce the time required to identify locate and troubleshoot network faults. That keeps the operation running smoothly and helps defuse costly downtime.

Real time alarm data allows proactive responses for corrective action and prevents problem escalation.

Integrated and automatic fault correlation will give real-time information about transmission impact and straightforward indications on root causes gives operators more effective support to immediately assess the consequence of network faults and consequently plan and prioritize in-fields interventions. This will reduce mean down time, mean time between maintenance and mean repair time. Operator will keep the right to have the possibility to inhibit correlation mechanism and to see detailed primary and secondary alarms through action at every topology scope (cable segment, fiber pair or transmission trail),

Next generation platform will allow customization of different alarms sub lists in which current alarms can be grouped according to user setting, comprehensive

filtering criteria that let operators focus on a subset of alarms of interest, suggests corrective actions for each root cause, and provides the user with an opportunity to create additional rules during alarm correlation invocation.

### 3.5 Maintenance history

History of past network problems and the reason for their occurrence will be useful for future planning. For example, if it's apparent that a certain device fails often, it may be decided to replace all such device, to plan a health check program of such device deployed inside the network.

New platform will embed software module to track past network problems.

### 3.6 Modular deployment

Next generation submarine platform will allow flexible deployment with base package and additional plug-in modules, allowing gradual function upgrade to reduce initial cost and rapid deployment of upgrades.

Additional packages are the following :

- Advanced security features bringing features like login control, security alarms, IP filtering, OEM upgrade by more secured release etc. requiring security administration skills from the operator.
- External interfaces. Such modules are required for customers that want to integrate the platform in their Operational Support System environment including network inventory, alarm hand-off and performance monitoring domains.
- Advanced Operation & Maintenance functionalities allowing operator to use advanced trace and log mechanisms, construction and configuration features etc.
- High-availability (HA) function with multiple servers or single server on top of which multiple application instance can run greatly improving system and service reliability. The HA will support 1+1 and 1+N paradigm in order to reduce CAPEX. Such paradigm allow to protect one machine (active) by one machine (standby) or a set of machines (actives) by one machine (standby). Switch over between active and standby will be achieved within few minutes.
- Power Coordination System (PCS) guiding operators during ramping up or shutting down the power feeding of the submarine cable. According to the segment power configuration, these procedures display to the operator, step by step, different sequence of commands to be applied to the power feed equipment (PFE), and commands for configuring power switchable branching units (BUs).
- Fiber pair management by two operators using multiple applications. If two operators share the same

segment, the system is separated into 2 virtual segments. One operator manages a set of fiber pairs and the other one manages a second set of fiber pairs. Both operators have synthetic information on the network powering at. One operator only is responsible of the PFEs management and PFE configuration.

- End to End path management including backhaul or terrestrial interlinks. Through a single application it will be possible to get end to end path monitoring (fault and performance), to get end to end topology view and a navigation facility will exist to navigate from terrestrial SDH view to detailed submarine optical and WDW views.
- Common and integrated management including both repeated and un-repeated segments.

#### **4 SECURITY ASPECTS**

The 21<sup>st</sup> century has seen a rapid acceleration in the evolution of new threats both in the velocity of change and the increased intent of malice. Productivity can be significantly compromised by unmanaged web browsing. To be effective a web security solution should address both the threats that users will encounter during remote operation from external facilities and the need for fast efficient web browsing. Essentially, the solution should provide a unified policy framework for blocking dangerous content and optimizing the performance and availability of trusted content. The solution will be will be flexible enough to allow security feature inhibition in case operator manages the network is secured environment like private local area network and wide area network. Any modification and activity made through the system will be traced.

Additional components are web proxy for single point access. There's also a need for easy administration tools for policy management and reporting along with regular up-to-date protection against any new threat. It will be necessary also to have regular security audit pinpointing security holes in data communication network visible externally such as open ports.

Web security needs to achieve optimal protection without negatively impacting the regular operation or significantly increasing administrative effort.

A complete security solution will provide :

- Embedded security by hardening devices, protocols
- Enabled security by integrating host health check with network access authorization
- Security policy to manage user roles and user profiles

#### **5 SCALABILITY , FLEXIBILITY AND ADAPTABILITY**

Flexible and scalable deployment capabilities permit support for small and large deployments, allowing centralised and distributed architecture to support a diversity of operations organizations (one Network Operation Center (NOC), geographically distributed NOCs, presence of Disaster Recovery Centers, split of network supervision among different departments, ...) or to support growth as needed (e.g. the number of network elements to be managed).

Next generation submarine management platform will run on various operating systems and hardware (HW) platforms like Linux or Unix in order to reduce Capital Expenditures and open the way to HW diversification.